applied sciences

MDPI

Editorial

Special Issue on Modelling, Simulation and Data Analysis in Acoustical Problems

Claudio Guarnaccia [1,*], Lamberto Tronchin [2] and Massimo Viscardi [3]

1 Department of Civil Engineering, University of Salerno, 84084 Fisciano, Italy
2 Department of Architecture, University of Bologna, 40126 Bologna, Italy; lamberto.tronchin@unibo.it
3 Department of Industrial Engineering, University of Napoli, 80138 Napoli, Italy; massimo.viscardi@unina.it
* Correspondence: cguarnaccia@unisa.it

Received: 19 November 2019; Accepted: 23 November 2019; Published: 3 December 2019

1. Introduction

Modelling and simulation in acoustics is gathering more and more importance nowadays. In fact, with the development and improvement of innovative computational techniques and with the growing need of predictive models, an impressive boost has been observed in this domain. The design of a model needs a proper conversion of reality to functions and parameters. On the other hand, once the model has been designed, an adequate simulation must be run, in terms of modelling and computational parameters. Keeping in mind the limitation and the approximations of any model, the data analysis, both online and offline, is the last step of this process and can be extremely important to extract the required output from the process.

These basic and general concepts can be applied in many acoustical problems. In acoustics, in fact, there is a large demand for modelling and simulation, in several research and application areas, such as noise control, indoor acoustics, industrial applications, etc.

These motivations led us to the proposal of a Special Issue about "Modelling, Simulation and Data Analysis in Acoustical Problems", since we definitely believe in the importance of these topics in modern acoustics studies. In total, 81 papers were submitted and 33 were published, with an acceptance rate of 37.5%. Among the 33 papers published, two of them were classified as review papers, while the rest were classified as research papers. According to the number of papers submitted, it can be affirmed that this is a trendy topic in the scientific and academic community and this special issue will try to be a future reference for research to be developed in the next years.

2. Modelling, Simulation and Data Analysis in Acoustical Problems

As stated in the introduction, the need of models in acoustical problems is very large and can interest many subareas of acoustics. Withstanding this variety of possible applications and considering the interdisciplinary features of the Special Issue, several topics were studied in the papers submitted to the issue.

The noise control topic is studied by Wang et al. [1] and Zhang et al. [2], regarding respectively noise barrier insertion loss and car silencers.

Medical applications are presented in [3–6]. Hearing issues are studied by Cucis et al., comparing normal-hearing subjects and cochlear implant users, and Ito et al., regarding the effects of surgical instruments in ear surgery. High-intensity focused ultrasound (HIFU) non-invasive therapy is studied by Liu et al., Tan et al. and Gutierrez et al., concerning respectively the prediction of HIFU propagation in a dispersive medium, the influence of dynamic tissue properties on HIFU hyperthermia and acoustic field of focused ultrasound transducers.

In addition to HIFU, ultrasound waves are presented in several and various applications [7–10]. In particular, Choo et al. proposes a method to estimate the soil depth based on elastic wave velocity. Some underwater applications are presented by Wang et al. and Wang et al., considering respectively underwater acoustic communication and channel modelling and estimation, and underwater acoustic sources estimation. Jin et al. [11] presents an application of hydro-elastic analysis of a submerged floating tunnel under extreme wave and seismic excitations.

The topic of the acoustic ultrasound emissions study for monitoring of fatigue crack growth in mooring chains [12] and for rail defect detection [13] is faced respectively by Angulo et al. and Shi et al., with very interesting results. Dobrzychi et al. applies the acoustic emissions technique to epoxy resin electrical treeing study [14]. Also, Teng et al. [15] proposes the evaluation of cracks in metallic material.

Vibration and vibroacoustic studies are presented in [16–19], by Chatterhee et al., Wu et al. and Qian et al., with applications to parabolic tapered annular circular plate (Chatterhee et al. 2018 and 2019) and sensorized prodder for landmine detection (Wu et al.). Also, Flückiger et al. studies the vibrations, but referred to piano keys and their influence on piano players' perception and performance [20].

Yin et al. [21] and Jiang et al. [22] present their results on transducers, respectively on a 3D model of electromagnetic acoustic transducers and balanced armature receiver optimal design.

Target speech with nonlinear soft masking is presented by Zou et al. [23] while Tronchin et al. [24] reports a study about spatial information on voice generation.

Propagation in a fluid-filled polyethylene pipeline is studied from an experimental point of view by Li et al. in [25].

Bo et al. [26] presents a study on the acoustics of the Syracuse open-air theatre, with experiments and simulations. A room acoustic experiment is proposed by Wang et al. in [27] to investigate fingerprinting acoustic localization indoors.

Noncontact audio recording and a multi-frame Principal Component Analysis (PCA) based stereo audio coding method are proposed respectively by Sato et al. [28] and Wang et al. [29].

Tarrazó-Serrano et al. [30] proposes a material for acoustic lenses compatible with magnetic resonance imaging.

An acoustic detection method for localization is proposed by Yin et al. in [31].

Kirkup [32] proposes a survey of the boundary element method in acoustics.

Sparse impulse response estimation is treated in [33] by Lim et al.

3. Conclusions

All the researches presented, published in this Special Issue, suggest that the topic of modelling and simulation in acoustic problems is extremely important and popular in the scientific community. The advances proposed by all the authors push further the knowledge in this area and open the way to new and interesting possible evolutions. We believe that this issue could become a reference in the near future of modelling and simulation in acoustics. The new horizons in this research area will be traced starting by state of the art innovations largely represented by the papers of this issue.

Acknowledgments: The success of this Special Issue is strongly related to the huge work and the great contributions of all the authors. In addition, we acknowledge the hard work and the professional support of the reviewers and of the editorial team of Applied Sciences. We are extremely grateful to all the reviewers involved in the issue, for their time and their knowledge. We congratulate the assistant editors from MDPI that collaborated with us and thank them for their tireless support. We hope that the editorial process, starting from the submission and focusing on the review, was appreciated by all the authors, despite the final decisions. The real value of the time and the work spent in this process must be traced in the help provided to the authors to improve their papers.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Wang, H.; Luo, P.; Cai, M. Calculation of Noise Barrier Insertion Loss Based on Varied Vehicle Frequencies. *Appl. Sci.* **2018**, *8*, 100. [CrossRef]

2. Zhang, H.; Fan, W.; Guo, L. A CFD Results-Based Approach to Investigating Acoustic Attenuation Performance and Pressure Loss of Car Perforated Tube Silencers. *Appl. Sci.* **2018**, *8*, 545. [CrossRef]
3. Cucis, P.; Berger-Vachon, C.; Hermann, R.; Millioz, F.; Truy, E.; Gallego, S. Hearing in Noise: The Importance of Coding Strategies—Normal-Hearing Subjects and Cochlear Implant Users. *Appl. Sci.* **2019**, *9*, 734. [CrossRef]
4. Ito, T.; Kubota, T.; Furukawa, T.; Matsui, H.; Futai, K.; Hull, M.; Kakehata, S. The Role of Powered Surgical Instruments in Ear Surgery: An Acoustical Blessing or a Curse? *Appl. Sci.* **2019**, *9*, 765. [CrossRef]
5. Liu, S.; Yang, Y.; Li, C.; Guo, X.; Tu, J.; Zhang, D. Prediction of HIFU Propagation in a Dispersive Medium via Khokhlov–Zabolotskaya–Kuznetsov Model Combined with a Fractional Order Derivative. *Appl. Sci.* **2018**, *8*, 609. [CrossRef]
6. Tan, Q.; Zou, X.; Ding, Y.; Zhao, X.; Qian, S. The Influence of Dynamic Tissue Properties on HIFU Hyperthermia: A Numerical Simulation Study. *Appl. Sci.* **2018**, *8*, 1933. [CrossRef]
7. Gutierrez, M.; Ramos, A.; Gutierrez, J.; Vera, A.; Leija, L. Nonuniform Bessel-Based Radiation Distributions on A Spherically Curved Boundary for Modeling the Acoustic Field of Focused Ultrasound Transducers. *Appl. Sci.* **2019**, *9*, 911. [CrossRef]
8. Choo, H.; Jun, H.; Yoon, H. Application of Elastic Wave Velocity for Estimation of Soil Depth. *Appl. Sci.* **2018**, *8*, 600. [CrossRef]
9. Wang, X.; Wang, X.; Jiang, R.; Wang, W.; Chen, Q.; Wang, X. Channel Modelling and Estimation for Shallow Underwater Acoustic OFDM Communication via Simulation Platform. *Appl. Sci.* **2019**, *9*, 447. [CrossRef]
10. Wang, F.; Chen, Y.; Wan, J. In-Depth Exploration of Signal Self-Cancellation Phenomenon to Achieve DOA Estimation of Underwater Acoustic Sources. *Appl. Sci.* **2019**, *9*, 570. [CrossRef]
11. Jin, C.; Kim, M. Time-Domain Hydro-Elastic Analysis of a SFT (Submerged Floating Tunnel) with Mooring Lines under Extreme Wave and Seismic Excitations. *Appl. Sci.* **2018**, *8*, 2386. [CrossRef]
12. Angulo, Á.; Tang, J.; Khadimallah, A.; Soua, S.; Mares, C.; Gan, T. Acoustic Emission Monitoring of Fatigue Crack Growth in Mooring Chains. *Appl. Sci.* **2019**, *9*, 2187. [CrossRef]
13. Shi, H.; Zhuang, L.; Xu, X.; Yu, Z.; Zhu, L. An Ultrasonic Guided Wave Mode Selection and Excitation Method in Rail Defect Detection. *Appl. Sci.* **2019**, *9*, 1170. [CrossRef]
14. Dobrzycki, A.; Mikulski, S.; Opydo, W. Using ANN and SVM for the Detection of Acoustic Emission Signals Accompanying Epoxy Resin Electrical Treeing. *Appl. Sci.* **2019**, *9*, 1523. [CrossRef]
15. Teng, X.; Zhang, X.; Fan, Y.; Zhang, D. Evaluation of Cracks in Metallic Material Using a Self-Organized Data-Driven Model of Acoustic Echo-Signal. *Appl. Sci.* **2019**, *9*, 95. [CrossRef]
16. Chatterjee, A.; Ranjan, V.; Azam, M.; Rao, M. Theoretical and Numerical Estimation of Vibroacoustic Behavior of Clamped Free Parabolic Tapered Annular Circular Plate with Different Arrangement of Stiffener Patches. *Appl. Sci.* **2018**, *8*, 2542. [CrossRef]
17. Chatterjee, A.; Ranjan, V.; Azam, M.; Rao, M. Comparison for the Effect of Different Attachment of Point Masses on Vibroacoustic Behavior of Parabolic Tapered Annular Circular Plate. *Appl. Sci.* **2019**, *9*, 745. [CrossRef]
18. Wu, Z.; Ma, H.; Wang, C.; Li, J.; Zhu, J. Numerical Analysis of a Sensorized Prodder for Landmine Detection by Using Its Vibrational Characteristics. *Appl. Sci.* **2019**, *9*, 744. [CrossRef]
19. Qian, C.; Ménard, S.; Bard, D.; Negreira, J. Development of a Vibroacoustic Stochastic Finite Element Prediction Tool for a CLT Floor. *Appl. Sci.* **2019**, *9*, 1106. [CrossRef]
20. Flückiger, M.; Grosshauser, T.; Tröster, G. Influence of Piano Key Vibration Level on Players' Perception and Performance in Piano Playing. *Appl. Sci.* **2018**, *8*, 2697. [CrossRef]
21. Yin, W.; Xie, Y.; Qu, Z.; Liu, Z. A Pseudo-3D Model for Electromagnetic Acoustic Transducers (EMATs). *Appl. Sci.* **2018**, *8*, 450. [CrossRef]
22. Jiang, Y.; Xu, D.; Jiang, Z.; Kim, J.; Hwang, S. Comparison of Multi-Physical Coupling Analysis of a Balanced Armature Receiver between the Lumped Parameter Method and the Finite Element/Boundary Element Method. *Appl. Sci.* **2019**, *9*, 839. [CrossRef]
23. Zou, Y.; Liu, Z.; Ritz, C. Enhancing Target Speech Based on Nonlinear Soft Masking Using a Single Acoustic Vector Sensor. *Appl. Sci.* **2018**, *8*, 1436. [CrossRef]
24. Tronchin, L.; Kob, M.; Guarnaccia, C. Spatial Information on Voice Generation from a Multi-Channel Electroglottograph. *Appl. Sci.* **2018**, *8*, 1560. [CrossRef]

25. Li, Q.; Song, J.; Shang, D. Experimental Investigation of Acoustic Propagation Characteristics in a Fluid-Filled Polyethylene Pipeline. *Appl. Sci.* **2019**, *9*, 213. [CrossRef]
26. Bo, E.; Shtrepi, L.; Pelegrín Garcia, D.; Barbato, G.; Aletta, F.; Astolfi, A. The Accuracy of Predicted Acoustical Parameters in Ancient Open-Air Theatres: A Case Study in Syracusae. *Appl. Sci.* **2018**, *8*, 1393. [CrossRef]
27. Wang, S.; Yang, P.; Sun, H. Fingerprinting Acoustic Localization Indoor Based on Cluster Analysis and Iterative Interpolation. *Appl. Sci.* **2018**, *8*, 1862. [CrossRef]
28. Sato, R.; Emoto, T.; Gojima, Y.; Akutagawa, M. Automatic Bowel Motility Evaluation Technique for Noncontact Sound Recordings. *Appl. Sci.* **2018**, *8*, 999. [CrossRef]
29. Wang, J.; Zhao, X.; Xie, X.; Kuang, J. A Multi-Frame PCA-Based Stereo Audio Coding Method. *Appl. Sci.* **2018**, *8*, 967. [CrossRef]
30. Tarrazó-Serrano, D.; Castiñeira-Ibáñez, S.; Sánchez-Aparisi, E.; Uris, A.; Rubio, C. MRI Compatible Planar Material Acoustic Lenses. *Appl. Sci.* **2018**, *8*, 2634. [CrossRef]
31. Yin, J.; Xiong, C.; Wang, W. Acoustic Localization for a Moving Source Based on Cross Array Azimuth. *Appl. Sci.* **2018**, *8*, 1281. [CrossRef]
32. Kirkup, S. The Boundary Element Method in Acoustics: A Survey. *Appl. Sci.* **2019**, *9*, 1642. [CrossRef]
33. Lim, J.; Lee, S. Regularization Factor Selection Method for l1-Regularized RLS and Its Modification against Uncertainty in the Regularization Factor. *Appl. Sci.* **2019**, *9*, 202. [CrossRef]